

REMARKS

The Final Office Action dated October 4, 2004, has been received and reviewed.

Claims 38-69 are currently pending and under consideration in the above-referenced application. Each of claims 38-69 stands rejected.

Reconsideration of the above-referenced application is respectfully requested.

Rejections Under 35 U.S.C. § 103(a)

Each of claims 38-69 stands rejected under 35 U.S.C. § 103(a).

The standard for establishing and maintaining a rejection under 35 U.S.C. § 103(a) is set forth in M.P.E.P. § 706.02(j), which provides:

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaack*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

Purported APA in View of Hashimoto

Claims 38-41, 44-55, 58-63, and 66-69 stand rejected under 35 U.S.C. § 103(a) for reciting subject matter which is assertedly unpatentable over that taught in applicant's purportedly admitted prior art (hereinafter "the Purported APA") in combination with U.S. Patent 6,410,366 to Hashimoto (hereinafter "Hashimoto").

The Office asserts that the above-referenced application admits that, prior to the filing date of the above-referenced application, it was known in the art to disposed semiconductor dice with centrally aligned bond pads on substrates in a flip-chip fashion.

Hashimoto also teaches use of flip-chip connection techniques to secure semiconductor dice with centrally aligned bond pads to larger scale substrates. More specifically, Hashimoto teaches forming bumps 11 on the active surface of a semiconductor die 10 which has bond

pads 12 that are arranged along a straight line L. FIG. 1A; col. 5, lines 24-58. Each bump 11 apparently includes a single layer of material.

The bumps 11 on the semiconductor die 10 are positioned so as to align with corresponding bumps 21 of a substrate 20 as the semiconductor die 10 is positioned face-down (*i.e.*, in a flip-chip fashion) over the substrate 20. FIG. 1B; col. 6, line 60, to col. 7, line 17. When positioned against each other, a bump 11 of the semiconductor die 10 and a corresponding bump 21 of the substrate 20 form a support. FIG. 1B; col. 7, lines 18-33. Bumps 21 also appear to include only a single layer of material.

Hashimoto also teaches that, following the positioning of a semiconductor die 10 over a substrate 20, an anisotropic conductive material 40 may be disposed therebetween and cured, permanently securing the semiconductor die 10 and substrate 20 to one another. Col. 7, line 39, to col. 8, line 7. As the type of bonding taught in Hashimoto is permanent, rather than the temporary electrical connections (typically under a biasing load) that are made when a semiconductor die is oriented over a test substrate, it is readily apparent that Hashimoto does not teach or suggest that the substrate 20 thereof may comprise a test substrate.

A *prima facie* case of obviousness has not been established against any of claims 38-41, 44-55, 58-63, or 66-69.

First, with respect to each of claims 38-41, 44-55, 58-63, and 66-69, it is respectfully submitted that the only motivation for one of ordinary skill in the above-referenced application to incorporate the teachings of Hashimoto into the Purported APA would have been the hindsight provided by the above-referenced application. Only the disclosure of the above-referenced application, not any of the art of record therein, indicates that semiconductor dice with centrally located, linearly arranged bond pads may be disposed over any type of substrate in a flip-chip fashion or that stabilizers or similar structures may be used to facilitate such flip-chip type attachment. As such, the Office has not met its burden of establishing that one of ordinary skill in the art would have been motivated to make the asserted combination, and a *prima facie* case of obviousness has not been established.

Additionally, with respect to the subject matter recited in claims 53-55, 58, and 59, and 60-63 and 66-69, one of ordinary skill in the art would not have been motivated to combine the Purported APA and the teachings of Hashimoto in such a way as to replace the permanent carrier substrate 20 thereof with a test substrate. This is because Hashimoto lacks any teaching or suggestion that corresponding bumps 11 and 21 are secured to one another. Therefore, bumps 11 and 21 only temporarily space semiconductor die 10 from a substrate, while solder balls between the die 10 and substrate 20 stabilize the die 10 relative to the substrate 20. *See, e.g.*, col. 7, line 41, to col. 8, line 7.

If substrate 20 were a test substrate, however, the die 10 would not be stabilized relative to the substrate 20. This is because neither the nonpermanent electrical connections used in a test substrate nor the unsecured bumps 11 and 21 of Hashimoto would stabilize the die 10 relative to the substrate 20. In contrast, independent claim 53 requires, among other things, that at least one stabilizer that protrudes from a test substrate be configured to at least partially stabilize a semiconductor device upon disposal thereof face-down over the test substrate.

As there is no teaching or suggestion in either the Purported APA or Hashimoto that bumps 21 can stabilize a semiconductor die that is not permanently secured thereto, it appears that the only source of motivation for one of ordinary skill in the art to combine the Purported APA and the teachings of Hashimoto in the asserted manner would have been by improper reliance upon the hindsight provided by the disclosure of the above-referenced application.

Second, the Purported APA and Hashimoto do not teach or suggest each and every element of any of claims 38-41, 44-55, 58-63, or 66-69.

Independent claim 38 is directed to a semiconductor device that includes a substrate and at least one stabilizer. The at least one stabilizer of the semiconductor device of independent claim 38 includes a plurality of superimposed, contiguous, mutually adhered layers. It protrudes from the surface of the substrate and is configured to at least partially stabilize an orientation of the semiconductor device upon disposal thereof face-down over the test substrate.

The substrate of independent claim 38 includes contact pads that are exposed at a surface thereof. The contact pads are arranged in at least one substantially linear relationship positioned

at or proximate a centerline of the substrate. The contact pads are configured to communicate with corresponding test pads of a test substrate upon disposing said substrate face-down over said test substrate.

Neither the Purported APA nor Hashimoto teaches or suggests a semiconductor device that includes a stabilizer with a plurality of at least partially superimposed, contiguous, mutually adhered layers. While the Purported APA lacks any teaching or suggestion of stabilizers, the bumps 11 that protrude from the semiconductor die 10 of Hashimoto are merely single-layer structures.

Accordingly, it is respectfully submitted that the Purported APA and the teachings of Hashimoto do not support a *prima facie* case of obviousness against the subject matter recited in independent claim 38. It is, therefore, respectfully submitted that, under 35 U.S.C. § 103(a), amended independent claim 38 is directed to subject matter which is allowable over that taught in the Purported APA and Hashimoto.

Each of claims 39-41 and 44-52 is allowable, among other reasons, for depending either directly or indirectly from claim 38, which is allowable.

Claim 48 is also allowable since neither the Purported APA nor Hashimoto teaches or suggests a stabilizer which is elongated in a direction parallel to a plane in which the substrate is located. The American Heritage Dictionary of the English Language, Fourth Edition (2000, Houghton Mifflin) defines “elongate” as “[m]ade longer; extended.” Merriam-Webster Medical Dictionary (2002) defines “elongate” as “long in proportion to width.” The teachings of Hashimoto are directed to small bumps 11 and 21 that have conventional (*i.e.*, substantially spherical) configurations. Therefore, the bumps 11 and 21 of Hashimoto are not made longer, extended, or long in proportion to width. Thus, the bumps 11 and 21 of Hashimoto are not stabilizers that are elongated in a direction parallel to a plane in which a semiconductor die 10 is located. The purported APA lacks any teaching or suggestion of stabilizers.

Claim 49 is additionally allowable because the Purported APA and Hashimoto both lack any teaching or suggestion of a semiconductor device which includes a semiconductor wafer with stabilizers protruding from a surface thereof. According to the American Heritage Dictionary of the English Language, Fourth Edition, in electronics, a wafer is “[a] small thin circular slice of a

semiconducting material, such as pure silicon, on which an integrated circuit can be formed.” In contrast, the teachings of Hashimoto are limited to singulated semiconductor dice 10 with bumps 11 protruding therefrom. No stabilizers protrude from the surfaces of the dice of the purported APA.

Claim 51 is further allowable since the Purported APA and Hashimoto do not teach or suggest a semiconductor device that comprises a chip-scale package with at least one stabilizer protruding from a surface thereof. Rather, the teachings of Hashimoto are limited to bare semiconductor dice 10 with bumps 11 protruding therefrom; there is no protective material, as would be required for any type of “package,” including a chip-scale package. The Purported APA likewise lacks any teaching or suggestion of chip-scale packages.

Independent claim 53 is drawn to a test substrate that includes a substrate and at least one stabilizer protruding from a surface of the substrate. The at least one stabilizer is configured to at least partially stabilize a semiconductor device upon disposal thereof face-down over the test substrate. The substrate includes test pads, which are exposed at a surface thereof and are arranged in at least one substantially linear relationship. The test pads are also configured to communicate with corresponding contact pads of the semiconductor device.

It is respectfully submitted that neither the Purported APA nor Hashimoto teaches or suggests a test substrate of the type recited in independent claim 53. Instead, the teachings of Hashimoto are limited to a carrier substrate that includes stabilizing bumps 21 thereon. This is evident from Hashimoto’s teaching that the substrate 20 is configured to have a semiconductor die 10 permanently secured thereto (*e.g.*, by way of anisotropically conductive material 40 – col. 7, line 41, to col. 8, line 7), rather than temporarily secured thereto, as would be the case if substrate 20 were a test substrate. The Purported APA is limited to semiconductor dice with centrally located, linearly arranged bond pads. Accordingly, it is respectfully submitted that the Purported APA and Hashimoto do not teach or suggest each and every element of independent claim 53.

Claims 54, 55, 58 and 59 are both allowable, among other reasons, for depending either directly or indirectly from claim 53, which is allowable.

Claim 58 is additionally allowable because the Purported APA and Hashimoto do not teach or suggest at least one stabilizer that comprises “a plurality of . . . mutually adhered layers.”

In this regard, the Purported APA lacks any teaching or suggestion of spacers, while Hashimoto neither teaches nor suggests that bumps 11 and 21 may be adhered or otherwise secured to one another.

Independent claim 60 recites an assembly of a semiconductor device and a test substrate. The test substrate of the assembly includes a plurality of test pads exposed at a surface thereof and arranged in at least one substantially linear relationship. The semiconductor device of the assembly includes a plurality of contact pads exposed at a surface thereof and arranged in at least one substantially linear relationship which is located at or proximate a centerline of the semiconductor device. The contact pad-bearing surface of the semiconductor device faces the test pad-bearing surface of the test substrate. Independent claim 60 recites that corresponding contact pads and test pads are in *temporary* communication with one another. In addition, at least one stabilizer is disposed the test substrate and the semiconductor device.

Again, the substrate 20 of Hashimoto is not a test substrate, as required by independent claim 60. Rather, it is carrier substrate, which is very different from a test substrate. Further, the teachings of Hashimoto are limited to permanently securing bond pads (*i.e.*, electrodes 12) of a semiconductor die 10 to corresponding terminals (*i.e.*, interconnect pattern 22) of a substrate (col. 7, line 41, to col. 8, line 7), as opposed to the *temporary* communication recited in independent claim 60.

Therefore, the Purported APA and Hashimoto do not, either individually or together, teach or suggest each and every element of independent claim 60, as would be required to maintain the 35 U.S.C. § 103(a) rejection thereof.

Claims 61-63 and 66-69 are each allowable, among other reasons, for depending from claim 60, which is allowable.

Claim 66 is further allowable since none of the purported APA, Hashimoto, or Sasaki teaches or suggests at least one stabilizer that comprises “a plurality of . . . mutually adhered layers.” In this regard, the purported APA lacks any teaching or suggestion of spacers, while

Hashimoto neither teaches nor suggests that bumps 11 and 21 may be adhered or otherwise secured to one another.

For at least these reasons, it is respectfully submitted that a *prima facie* case of obviousness has not been established against any of claims 38-41, 44-55, 58-63, and 66-69 and, thus, that each of these claims recites subject matter which, under 35 U.S.C. § 103(a), is allowable over the Purported APA and the teachings of Hashimoto.

Purported APA, Hashimoto, and Sasaki

Claims 42, 43, 56, 57, 64, and 65 stand rejected under 35 U.S.C. § 103(a) for reciting subject matter which is allegedly unpatentable over the subject matter taught in the Purported APA, in view of teachings from Hashimoto and JP 402210329 of Sasaki (hereinafter “Sasaki”).

Sasaki teaches single-layered spacers that are formed from photopolymer.

Claims 42 and 43 are both allowable, among other reasons, for respectively depending directly and indirectly from claim 38, which is allowable.

Claims 56 and 57 are both allowable, among other reasons, for respectively depending directly and indirectly from claim 53, which is allowable.

Claims 64 and 65 are both allowable, among other reasons, for respectively depending directly and indirectly from claim 60, which is allowable.

In view of the foregoing, withdrawal of the 35 U.S.C. § 103(a) rejections of claims 38-69 is respectfully requested.

CONCLUSION

It is respectfully submitted that each of claims 38-43 and 45-69 is allowable. An early notice of the allowability of each of these claims is respectfully solicited, as is an indication that the above-referenced application has been passed for issuance. If any issues preventing allowance of the above-referenced application remain which might be resolved by way of a telephone conference, the Office is kindly invited to contact the undersigned attorney.

Respectfully submitted,



Brick G. Power
Registration No. 38,581
Attorney for Applicant
TRASKBRITT, PC
P.O. Box 2550
Salt Lake City, Utah 84110-2550
Telephone: 801-532-1922

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